# The Training School Bulletin

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**Electrical Sensitivity of the Eye**
Clausen-Karrer

**Intelligence and Achievement**
Holowinsky

**Adjustment and Habilitation**
Niehm-Kradel

**Studies of Hearing Loss**
Rigrodsky-Prunty-Glovsky

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**the training school BULLETIN**

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*Editorial:*

# Tools of the Trade

Techniques for carrying on professional work always seem to fall below what the worker needs. No sooner is a technique or procedure of operation crystallized than it is found to be not perfect to do its job and a better one is needed.

For the true professional worker, whatever his field, the desire for improving methods of accomplishing his job is incessant. It is as much a part of his work as are his accomplishments. Realizing the inadequacies of his techniques, he is ever ready to underplay his activities and the results he has obtained.

How different in this respect are many articles we read, where the emphasis is not on how to develop better tools to achieve better results, but on how things "should" be done. Herein we find references to techniques and descriptions of their efficacy which would lead us to believe Utopia could be reached did we but make proper (in the eyes of the writer) use of the skills and techniques at hand which have been so well constructed.

This is most misleading. Most of us see our Bali Hai along the distant horizon, but we have no craft to bring us there. The crude raft on which we stand does float, but much more is needed to traverse the awesome distance in between.

We need ever so much more attention given to the tools of our trades. This means intensive investigation into the various areas of our work and a knowledge of where we want to go. The answer can only come from the studious, sincere worker who, unfortunately, is frequently too busy to spend much time in writing about his activities.

W. J.

# Electrical Sensitivity of the Eye in the Mentally Retarded[1]

Johs. Clausen and Rathe Karrer

It is generally agreed that when a sensation of flickering light is produced by alternating or intermittent electrical current across the eye, this sensation results from stimulating neural structures of the eye, probably the bipolar cells of the retina. (For references concerning the site of electrical stimulation see Clausen and Karrer (1961). Whether the phosphene threshold reflects the excitability of just the bipolar cells or is a general indicator of the excitability of more central structures is an intriguing question. If the latter is true the phosphene threshold might be a unique means of studying cases with central nervous system involvement.

As an initial exploration of the potentialities we have recorded phosphene threshold on 55 young mentally retarded subjects (43 males and 12 females) of varied etiologies. Information about age, IQ, MA and etiological classification of these subjects is presented in Table 1. The phosphene threshold of the retarded subjects has been compared with that

**Table 1**

**Distribution of Age, IQ, MA (in months) and Etiological Classification for the Retarded Subjects**

| Age | M | F | IQ | M | F | MA | M | F | Etiology | M | F |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8-10 | 1 | — | 30-34 | 2 | — | 50-59 | 1 | — | Familial | 3 | 0 |
| 10-12 | 5 | 1 | 35-39 | 4 | 2 | 60-69 | 2 | 1 | Organic | 17 | 2 |
| 12-14 | 5 | 2 | 40-44 | 8 | — | 70-79 | 14 | — | Unexplained | 12 | 2 |
| 14-16 | 6 | 4 | 45-49 | 9 | 2 | 80-89 | 15 | 3 | Mixed | 7 | 1 |
| 16-18 | 1 | 1 | 50-54 | 8 | 2 | 90-99 | 7 | 3 | Mongoloid | 1 | 0 |
| 18-20 | 7 | 1 | 55-59 | 5 | — | 100-109 | 4 | — | Not Classifiable | 3 | 1 |
| 20-22 | 15 | 3 | 60-64 | 3 | 3 | 110-119 | — | 4 | | | |
| 22-24 | 3 | — | 65-69 | 2 | 2 | Mean MA | 84 (7-0) | 92 (7-8) | | | |
| Mean Age | 17-8 | 16-2 | 70-74 | 1 | 1 | | | | | | |
| | | | 75-79 | 1 | — | | | | | | |
| | | | Mean IQ | 50 | 56 | | | | | | |

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[1] This study was supported by the National Science Foundation, Grant G-7029 and by the National Institutes of Health, Grant M-1394.

of normal subjects. Data for the normal control group has been taken from a previous study which concerned the relationship between phosphene threshold and age and sex (Clausen and Karrer 1959). We included all subjects who fell in the age range of the retarded subjects - 29 males and 31 females.

Most of the retarded subjects were included in another study (The Ability Structure Project) which allowed us to compare phosphene threshold with a wide variety of sensory, motor, perceptual and complex mental functions. Also we had information about the subject's medical and family history, neurological examination[2] and electroencephalography[3] which permitted a comparison with various clinical categories.

## Procedure

The phosphene threshold was recorded for 20 cps sine wave stimulation while the subject was facing a screen which reflected .03 mL. Ten thresholds, each being an average of an ascending and a descending series, were recorded and the total Mean computed. Further details about instrumentation, electrodes and procedure for determination of phosphene threshold are given in previous publications (Clausen 1955, Clausen and Karrer, 1959). Some of our subjects came from institutions other than The Training School and it was therefore not possible to repeat the procedure in a second session. Experience with normals shows that there is high reliability between the first and second session (Clausen and Karrer, 1959) and spot checking with individual retardates indicates that this is not different in the retarded group.

The test battery used in The Ability Structure Project included 34 different tests. A short summary of the purpose of the project and a listing of the tests has appeared in this journal (Clausen, 1959). Details about the tests, administration and scoring procedures will be described in a forthcoming publication.

## Results

Our investigation of the phosphene threshold in relation with age and sex in normals showed a significant sex difference for subjects below the age of 35. The comparison between retarded and normal subjects have therefore been made separately for the two sexes. Table 2 shows the Means and Standard Deviations of the various subgroups. The distribution of the phosphene thresholds in these subgroups is striking. From these data it appears that for both sex groups the retardates have a higher threshold than normals. None of the retarded boys have a threshold below 20 micro-

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[2] *The neurological examination was done by Dr. Geraldine King, University of Pennsylvania.*

[3] *The EEGs were recorded in our own laboratory and interpreted by Dr. Charles E. Henry, Institute of Living, Hartford, Connecticut.*

**Table 2**

Means and Standard Deviations of Phosphene Threshold (in microamps) for the Four Major Subgroups

| | N | M | S.D. |
|---|---|---|---|
| Retarded Males | 43 | 49.2 | 28.7 |
| Normal Males | 29 | 23.1 | 9.9 |
| Retarded Females | 12 | 30.3 | 11.6 |
| Normal Females | 31 | 16.8 | 8.7 |

amps while 50% of the normals have thresholds below 20. On the other hand, only one normal subject has a threshold above 35 microamps, while we find 61% of the retarded boys above this point. It also appears that the sex difference we found among the normals, with lower thresholds in the female group, is maintained in the retarded population.

Because of non-independence of means and standard deviations and of heterogeneity of variance, a non-parametric test, chi square with correction for discontinuity, was used to test the significance of the differences between groups.

The difference between the retarded males and females is not significant (chi square = 3.35) and neither is the difference between normal males and females (chi square = 2.86). The comparison between retarded and normal males gives a significant difference beyond the .001 level of confidence (chi square = 17.34). The difference between the retarded and normal females is also significant beyond the .01 level (chi square = 7.47). The two non-significant differences, however, reflect the same trend which reached significance in the normals (sex difference) in the previous age sex study which contained a sizable N. It is suggested that the small N of our samples and the great variability in the retardate groups are the primary cause of the non-significance.

Inspection of the data of the retarded subjects indicated that they differed from the normals in another aspect. In a previous study (Clausen and Karrer, 1961) we were concerned with the after effect of the electrical stimulation. We found that throughout a series of 5 consecutive threshold determinations the normal group had a tendency of a gradual increase in threshold. This was in contrast to 10 consecutive determinations

**Table 3**

Group Means and Standard Deviations for the Ten Consecutive Threshold Determinations (in microamps) for the Retarded Group (N=49)

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| M | 47.5 | 46.7 | 45.0 | 46.8 | 44.9 | 44.3 | 43.6 | 44.1 | 44.5 | 46.2 |
| S.D. | 28.3 | 31.2 | 28.3 | 28.8 | 26.1 | 25.6 | 24.8 | 26.4 | 26.3 | 28.4 |

for 5 trained observers in which no such increase was found. We interpreted this difference between trained and untrained observers in terms of decreased attention to threshold intensities throughout the session by the untrained observers and regarded it as a nonphysiological effect in contrast to other types of after-effect. The Mean and Standard Deviation of the retarded group for each of the 10 consecutive threshold determinations is listed in Table 3. It appears that there is no progressive increase in threshold throughout the series and that the standard deviations remains rather constant throughout. This indicates that the retarded group does not have the gradual increased threshold that one would expect to find among untrained subjects. The stability of the Means and Standard Deviations of Table 3 is also an indication of reliability of the threshold determinations. Another measure of reliability is the correlation coefficients between various threshold determinations in the series. We selected thresholds 1, 5 and 10 and found the following correlations: $r_{1\text{-}10}=0.81$, $r_{1\text{-}5}=0.90$ and $r_{5\text{-}10}=0.91$. These correlation coefficients indicate an unexpected reliability of the phosphene threshold in the retarded subjects.

It is our opinion that there is limited value in establishing a difference between normals and retardates unless one can reasonably explain the elevation of the retardate threshold. Some of our additional data allowed us to explore in this direction.

Neurological examination and electroencephalography provided us with an opportunity to compare phosphene thresholds with indications of CNS abnormality. Forty-nine of our subjects were divided into subgroups according to EEG, to neurological examination and to both combined. The subgroups are listed in Table 4, together with Mean and Standard Deviation for phosphene threshold. Again, because of non-independence of means and standard deviations and heterogeneity of variance a non-parametric test, chi square, was used to test the significance of the difference between groups. None of the differences approached significance at the .05 level.

In a similar manner the 49 retarded subjects were divided into subgroups of etiology as determined by the Riggs and Rain classification system (1952). The result of this comparison is entered in Table 4. Again the difference between groups did not reach significance with chi square. To be sure, some of the etiological categories are weakly represented in our sample. There are few familials, but comparatively many with organic signs. Within the organic group individuals with high as well as low phosphene thresholds are found.

The conclusion from these comparisons seems to be that neither etiology nor impairment of the CNS as diagnosed by electroencephalography or gross neurological examination is reflected in the phosphene threshold.

It seems appropriate to go one step beyond the clinical evaluation of the EEG and to compare phosphene threshold with alpha index. Electrical phosphenes are visual sensations and therefore involve the occipital cortex, the area where alpha waves are most pronounced. For this purpose we selected 10 males with the highest phosphene threshold and 10 males with the lowest threshold and compared per cent alpha and average alpha

**Table 4**

Mean and Standard Deviation of Phosphene Threshold (in microamps) for Subjects Grouped According to EEG, Neurological Examination, Both Combined and Etiology

| Subgroups | N | M | S.D. |
|---|---|---|---|
| EEG | | | |
| 1. Abnormal | 16 | 51.6 | 33.1 |
| 2. Borderline | 12 | 31.4 | 10.5 |
| 3. Normal | 21 | 49.8 | 28.8 |
| Neurological Signs | | | |
| 4. Severe Impairment | 7 | 47.3 | 20.1 |
| 5. Slight Impairment | 14 | 40.2 | 16.9 |
| 6. Normal | 28 | 48.3 | 33.9 |
| Combined | | | |
| 7. EEG and Neuro Abnormal | 8 | 37.8 | 17.2 |
| 8. EEG Abnormal - Neuro Normal | 20 | 45.0 | 30.8 |
| 9. EEG Normal - Neuro Abnormal | 12 | 46.6 | 18.8 |
| 10. EEG and Neuro Normal | 9 | 54.1 | 37.9 |
| Etiology | | | |
| 11. Familial | 3 | 33.6 | 6.8 |
| 12. Organic | 19 | 50.5 | 30.6 |
| 13. Unexplained | 14 | 45.3 | 27.2 |
| 14. Mixed | 8 | 44.9 | 35.2 |
| 15. Not Classifiable | 4 | 35.4 | 3.9 |

amplitude for the two groups. Alpha frequency was defined as the frequency range from 8 to 13 per sec. From the tracings of the right occipital-parietal leads two sections of 1 m. each (corresponding to 331/3 sec. of recording) were marked off and the waves within the alpha range identified. The accumulated linear distance these waves occupied gave a direct indication of per cent alpha. In a similar way, accumulated amplitude of the alpha waves divided by N and multiplied by the calibration factor gave the mean alpha amplitude in microvolts. We included all waves which satisfied the frequency criterion whether they occurred singularly or in rhythmic bursts. The final measure was the mean of the results from the two samples. The Means and the Standard Deviations of these two groups are seen in Table 5. Since the same restrictions are again present (heterogeneity of variance, non-independence of means and standard deviations) a

## Table 5

Individual Means, Group Means and Standard Deviations of Alpha Amplitude in Two Groups with Extremely Low and Extremely High Phosphene Thresholds

| Low Thresholds | | | | High Thresholds | | | |
|---|---|---|---|---|---|---|---|
| Subjects | Phosph. Thresh. in micro-amps | Per Cent Alpha | Average Alpha Ampl. in micro-volts | Subjects | Phosph. Thresh. in micro-amps | Per Cent Alpha | Average Alpha Ampl. in micro-volts |
| M. G. | 21.0 | 76.9 | 81.5 | L. H. | 60.0 | 33.6 | 27.7 |
| P. A. | 22.3 | 4.0 | 34.5 | J. C. | 63.5 | 34.2 | 33.6 |
| E. H. | 22.6 | 16.3 | 19.8 | W. L. | 78.0 | 10.4 | 12.9 |
| E. K. | 23.3 | 56.7 | 31.6 | H. B. | 85.0 | 4.9 | 21.2 |
| R. M. | 23.3 | 48.9 | 46.8 | P. F. | 87.6 | 71.2 | 49.8 |
| D. K. | 23.7 | 69.3 | 37.1 | R. M. | 96.8 | 15.6 | 21.6 |
| H. P. | 24.1 | 1.0 | 10.7 | J. H. | 110.7 | 48.0 | 26.4 |
| J. M. | 24.6 | 35.7 | 34.4 | L. J. | 113.0 | 22.9 | 61.1 |
| T. S. | 25.9 | 72.8 | 41.7 | R. L. | 113.5 | 22.3 | 45.2 |
| K. S. | 26.6 | 37.5 | 23.6 | R. W. | 134.9 | 44.8 | 23.1 |
| M | 23.7 | 41.9 | 36.2 | | 94.3 | 30.8 | 32.6 |
| S. D. | 1.6 | 26.5 | 18.2 | | 22.7 | 19.0 | 14.4 |
| Cases with Organic Signs | | | | | | | |
| N | | 6 | | | | 7 | |
| M | | 49.5 | | | | 28.9 | |
| S. D. | | 24.4 | | | | 10.3 | |

2 x 2 chi square with correction for discontinuity was used to assess the significance of the difference between the groups. According to this, the alpha amplitude is not significantly different in the two groups (chi square =0.81). Per cent alpha shows a substantial difference between the means (with modest overlap) with the higher incidence of alpha in the low threshold group. Chi square (1.8), however, is not significant. Inspection of the individual means for per cent alpha of the two groups shows that only three individuals in each group are widely deviant. It was noted that these deviant individuals, with only one exception, constituted a group without indicies of organicity. Excluding the individuals without positive neurological signs or without a positive medical history leaves 13 subjects. A simple correlation between per cent alpha and phosphene threshold produced an $r$ of - 0.61 which is significant beyond the .025 level.

It appears from our data that there is a strong indication of a relationship between phosphene threshold and per cent alpha in organic retardates even though the small N does not allow a definite conclusion. It seems equally evident that per cent alpha is not the only factor which relates to phosphene threshold, as there are exceptional cases with extremely low phosphene threshold and extremely low per cent alpha.

EEG tracings during intermittent photic stimulation (photic driving) were made on six of the 20 cases with extreme phosphene threshold. From this limited source we find no relationship between phosphene threshold and tendency to photic driving.

The data of The Ability Structure Project allowed us to probe in a different direction with regard to characteristics of the mentally retarded which may relate to their higher phosphene threshold. The test battery of this project was set up to measure a wide variety of sensory, motor, perceptual and complex mental functions. The question thus arises whether any of these measures correlate highly with the phosphene threshold. The test battery produced 92 scores which were rank-correlated with the phosphene threshold. The great majority of the resulting correlations were quite low. Such important variables as age, IQ and MA gave correlations of .20, .12, and .15 respectively. Only 11 coefficients were at the .05 level of confidence or better and these coefficients are listed in Table 6. By chance

**Table 6**

The 11 Out of 92 Scores Which Reached the .05 Level of Confidence or Better When Rank Correlated with Phosphene Threshold

| rho | p | Description of Score |
|---|---|---|
| .29 | .05 | Identification Threshold, Range |
| .29 | .05 | Simple Visual Reaction Time (Median) |
| .30 | .05 | Identification Threshold (Median) |
| .31 | .05 | Hand Dominance |
| .33 | .05 | Hand Precision Hits, Range |
| .34 | .02 | Speed of Lower Arm Movement (Mean) |
| .36 | .02 | Speed of Tapping (Mean) |
| .38 | .01 | Overall Auditory Threshold, Range |
| .39 | .01 | Speed of Lower Arm Movement, Range |
| .40 | .01 | Two Point Threshold, Right Lower Arm |
| .42 | .005 | Ataxiometry (Body Sway) Lateral |

alone one would expect 4.6 scores to reach or exceed the .05 level of confidence. Thus there are a few more scores having a significant correlation with phosphene threshold then would be expected by chance. The expectancy of one out of 100 correlations reaching the .01 level of confidence by chance refers to probability based on large numbers. In this connection, even 100 test correlations cannot be regarded in the category of large numbers. It is, therefore, within the realm of possibility that all of our significant correlations occur by chance.

If one would take the significant correlations at face value, the most likely interpretation would be that the four scores for ranges (Identification Threshold, Range; Hand Precision Hits, Range; Lower Arm Movement, Range and Auditory Threshold, Range) might reflect fluctuation of attention. Momentary lack of attention would produce a poor score which would increase the range. Simple Visual Reaction Time, Lower Arm Movement

and Tapping would indicate speed of arm movement and motor coordination. Identification Threshold, Two Point Threshold and also Simple Visual Reaction Time may be said to reflect speed and accuracy of perception. The function of Hand Dominance and Ataxiometry (sway in a lateral plane) may have a common element in laterality. It is, however, extremely difficult to understand the relationship between most of these functions and phosphene threshold.

In the dilemma of choosing between the two positions: (a) the significant correlations occur by chance and (b) it is indicated that phosphene threshold is related to attention, speed of movement, speed and accuracy of perception and laterality, we would like to indicate two arguments against the second position. The battery contains tests, other than those listed in Table 6, which involve attention, speed of movement and speed and accuracy of perception and which do not attain significant correlations with phosphene threshold. The 11 correlations, even if they are significant, are so low that they do not provide clues for understanding the elevated threshold of the retardates.

## Discussion

We have established that retarded individuals on the average have higher phosphene thresholds than normal individuals of corresponding age. The question then arises whether this difference reflects basic physiological characteristics of the retardates or is a secondary manifestation of their low mental level. It seems reasonable to believe that the retardates may have difficulty in understanding the instructions, have trouble in adjusting to the situation since it involves a sensory experience with some degree of novelty, and may be handicapped in attending to stimuli around threshold intensity. With regard to the last alternative we think we have data to make this position untenable. If fluctuation of attention was responsible for the high thresholds, one might expect a subject's threshold to show a relatively high degree of variability. The data presented in Table 3 and the high correlation coefficients between successive thresholds indicate clearly the stability of repeated determinations.

Another explanation might be that the high thresholds were caused by difficulties in understanding the instructions. Considerable effort, however, was made by the examiner to have the subject understand and to get valid recordings. Subjective evaluations during the procedure indicated cooperation of the subjects and gave the impression of reliable determinations. All of our retarded subjects had been through the test battery of the Ability Structure Project before the threshold determinations. Thus they had been exposed to 34 different tests - a total testing time of 8 to 10 hours over a period of 5 to 6 weeks - and had a fair amount of experience as test subjects. It is our opinion, therefore, that the high phosphene threshold in the retardates is not a secondary manifestation of intelligence level, but is a genuine characteristic of the individual.

As we have seen, dividing the subjects into subgroups of clinical categories according to neurological signs, EEG and etiology did not indicate any relationships to the magnitude of the phosphene threshold. Indication that psychological functions such as attention, speed of hand movement, speed and accuracy of perception and laterality are related to phosphene threshold has been interpreted as chance occurrances. In addition, the few significant correlations are so low that they are not of much help in providing clues for understanding the elevated phosphene threshold.

The finding of a relationship between per cent alpha and phosphene threshold in organics is particularly interesting. This suggests that phosphene threshold is related to central factors and thus lends promise to the significance of phosphene threshold in the investigation of brain pathology. It is the only indication we have found in this study which links the phosphene threshold to another functional characteristic. Since gross clinical classification in terms of neurological signs, EEG abnormality and etiology did not show relationship to phosphene threshold, the notion is strengthened that such groupings are too crude for investigation of mental retardation, pointing to the necessity of refined, quantitative measures.

It is probably premature to discuss the interpretation of the relationship between phosphene threshold and per cent alpha, as this would require a more detailed analysis of the frequencies which are present in the EEG record outside the alpha range. The question arises as to the importance of the alpha frequency in the arousal mechanism of the organism. Our results also seem to be at variance with the finding of Kennard and Willner (1945) who reported that subjects with low alpha activity and large amounts of high frequency low voltage activity (used as an indication of cortical arousal), were found to have hyperactive deep tendon reflexes of the arm and leg. These discrepancies may be resolved by further investigation.

Judging from our own experiences, the phosphenes produced at 20-30 microamps are so definite that it is difficult to understand how anybody can fail to recognize them. The implication is that the visual sensation at this intensity is not so clear in most of the retarded.

In a previous study (Clausen 1955) phosphene threshold has been related to the two factors of *accomodation* and *excitation*. It seems reasonable to consider the elevated thresholds in the retardates in this light, i.e., as a result of decreased nerve excitation or faster nerve accomodation. The most reasonable factor in the retardates seems to be decreased excitation. The relative importance of the two factors may be determined by plotting the frequency-intensity relationship for the retardates. Elevated threshold for low frequencies (below 20 cps) would indicate faster accomodation, elevated threshold for high frequencies (above 20 cps) would indicate decreased excitability.

It must be noted, however, that if excitability and accomodation are the significant factors it is difficult to understand why they do not show up in several of the tests in The Ability Structure battery.

The problem of the differences in phosphene threshold between retarded and normal subjects may be related to individual differences in threshold among normals. We are investigating this problem in a current study and any positive results may have a bearing upon the interpretation of phosphene threshold in the mentally retarded.

The next problem, then, is the lack of threshold increase throughout the series as we found it in the normals. This is a puzzling finding indeed. In the previous report we have explained the general threshold rise in normals as a function of diminished attention toward the end of the series. The lack of rise in the retardates may be a function of the active effort by the experimenter to keep the retarded subjects motivated throughout the series and thus maintaining their attentiveness. It is interesting to speculate that the lack of rise is a function of some inherent characteristic of the retardates but our data do not allow us either conclusion. This problem must remain the subject of a future investigation.

Our two positive findings, higher phosphene threshold in retarded subjects than in normals and a suggested relationship between phosphene threshold and per cent alpha indicate the fruitfulness of phosphene studies in relation to mental retardation and point to the direction of further investigations.

## Summary

Phosphene threshold at 20 cps sine wave stimulation was determined on 55 young mentally retarded subjects (43 males and 12 females) of varied etiology. In general, the retardates have a higher threshold than normals. While normal subjects have a tendency to increased threshold with successive determination, this was not found for the retarded.

Comparison of phosphene threshold to clinical subgroups according to etiology, gross neurological signs or EEG was negative. So was the comparison to average alpha amplitude and a number of tests for sensory, motor, perceptual and complex mental functions. There is, however, a strong indication of relationship between phosphene threshold and per cent alpha, specifically in subjects with evidence for organic involvement.

It has been concluded that the elevated threshold in the retarded group reflects physiological rather than psychological factors. The best working hypothesis emerging from the study is that the retarded subjects have diminished nerve excitability or faster nerve accomodation.

## References


Clausen, J., *Visual sensations (phosphenes) produced by AC sine wave stimulation.* Copenhagen: Ejnar Munksgaard, 1955.

Clausen, J., Patterns of sensori-motor skills in retardates. *Train. Sch. Bull.,* 1959, *56,* 58-61.

Clausen, J. and Karrer, R. Phosphene threshold as related to age and sex. *J. Psychol.,* 1959, *47,* 189-198.

Clausen, J. and Karrer, R. Perceived rate of electrical phosphenes as determined by matching square wave and sine wave flicker rates. *J. Psychol.,* 1961, *52,* 25-45.

Clausen, J. and Karrer, R. After effect of electrical stimulation to the eye. In preparation.

Kennard, M. A. and Willner, M. D. Correlation between electroencephalograms and deep reflexes in normal adults. *Dis. Nerv. System,* 1945, *6,* 337-342.

Riggs, Margaret M. and Rain, Margaret E. A classification system for the mentally retarded, Part I: Description. *Train. Sch. Bull.,* 1952, *49,* 75-84.

# The Relationship Between Intelligence (80-110 I.Q.) and Achievement in Basic Educational Skills[1]

Ivan Holowinsky

## Introduction

The need for this research is emphasized by the fact that the studies reported in the literature dealt with overall comparisons or correlations between educational achievement and intelligence. Very few studies were found dealing with the direct relationship between grade level achievement and specific levels of intelligence. Various aspects of the relationship between educational achievement and I.Q. were considered by a number of studies. Lemmon (1950) computed correlations between I.Q. and vocabulary score for various grade levels. Weber (1945) and Votaw (1946) devised a method of estimation using an equation based upon the Otis Quick Scoring Test of Mental Ability and American Council on Education Psychological Examination.

Collier (1933) compared tests of educational achievement with secondary school progress assessments. Banker (1931) did a comprehensive study on mental age distribution and school progress. Bradway (1945) conducted a study to determine the predictive value of the preschool items of the revised Stanford-Binet Scale. Key's (1940) study represented an attempt to ascertain the significance of group test I.Q.'s obtained in junior high school years for the prediction of academic achievement beyond high school. Relationship between grade placement and achievement in various school subjects was considered in the study by Holmes and Finley (1957).

There are numerous studies related to the problem of sex differences in educational achievement and it would be beyond the scope of this article to summarize all of these separate investigations.

Constancy of I.Q. is related to the predictive value of intelligence testing and we find here a number of studies holding quite extreme points of view.

Some appear to believe that existing tests can measure mental potential and can predict educational growth with such accuracy that

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[1] *This paper is based on a dissertation presented to the faculty of the College of Education, Temple University, in partial fulfillment of the requirements for the degree of Doctor of Education.*

inferences derived from them can not be questioned. Others have little or no faith in tests, marks, or norms. Both arguments appear to be based on superficial generalizations. While one agrees that objective measures of educational potential are not without errors, they, by all means, are much better estimates of educability than subjective judgments.

Finally, the most important need concerns a general lack of research on the ceilings of educational achievement of dull-normal students, commonly called "slow-learners." An inadequate public concern with the educational problems of dull-normal students is due in all probability to the fact that for an unsophisticated individual it is much easier to think in terms of opposites than in terms of the normal distribution. Therefore the public thinks about a student as being either retarded or normal, although there are significant differences in educational achievement within the range of "normal" intelligence.

The present study was designed to test the hypothesis that all students within ranges of the dull-normal and average intelligence are equally able to master basic educational skills. In addition the study was concerned with:

(1) Achievement in reading at various I.Q. and age levels.
(2) Achievement in arithmetic at various I.Q. and age levels.
(3) Relationship between achievement in reading and arithmetic.
(4) Relationship between grade placement and educational achievement.
(5) The top grade levels which these students attained depending upon their I.Q. or mental potenial.

## Procedures

Since this study dealt with the educational growth of students 12 to 17 years of age and within the 80-110 I.Q. range, the most desirable method of investigation would have been to test each year the same group of students, beginning at 12 years of age and continuing till 17 years of age. However, owing to limitations of time and opportunity it was not possible to employ this method.

As an alternative procedure 15 groups of students were used, 25 cases in each group, organized into five larger groups as to age level, and three groups as to the I.Q. level. In this manner each age group included 75 cases and each I.Q. group 125 cases.

Within these limitations of age and I.Q. every effort was made to insure random sampling or unbiased representation. First, 100 cases were selected for each I.Q. and age group, and then every fourth case was selected for the sample (e. g. 4, 8, 12, 16th etc.) giving 25 cases for each I.Q. and age group. In each group selected for the study both sexes were

represented. It was necessary to review the educational records of over 8,000 students of the Camden, N. J., Public Schools in order to select the 375 cases.

The success of the random selection procedure can be judged from obtained mean I.Q. for a given group. This is illustrated in Table One.

**Table 1**

I.Q. Means and Variability (Standard Deviations) for each Group

| | 80-89 | | 90-99 | | 100-110 | |
|---|---|---|---|---|---|---|
| C.A. | I.Q. | S.D. | I.Q. | S.D. | I.Q. | S.D. |
| 12-13 | 85.30 | 2.67 | 96.00 | 3.04 | 104.70 | 3.20 |
| 13-14 | 85.40 | 2.75 | 93.80 | 2.55 | 104.04 | 3.29 |
| 14-15 | 83.20 | 2.76 | 94.80 | 2.71 | 104.80 | 3.11 |
| 15-16 | 85.00 | 2.73 | 93.50 | 2.80 | 104.70 | 3.16 |
| 16-17 | 84.80 | 2.50 | 94.40 | 2.91 | 103.28 | 2.50 |

An attempt was made to select the sample from such schools, as would represent typical socio-economic backgrounds of Camden City. The following schools were included in the sample: Bonsall Elementary, Pyne Point Junior High, and Camden High School.

The mental potential of the students included in the study was measured by the Otis Quick Scoring Mental Ability Test, Beta and Gamma forms. The results of this test may be reported in I.Q.'s and M.A.'s, and the norms are based on nearly 18,000 school children.

The basic educational achievements selected for measurement were reading and arithmetic. Achievement in reading was measured by the California Reading Test, form AA, devised by Ernest Tiegs and Willis W. Clark, 1957 edition. Standardization of this test has been based on more than 50,000 cases at each test level. Basic information for the age grade norms were derived from a sample of approximately one-half million students in many school districts in twenty different states.

To measure achievement in arithmetic, the arithmetic part of the Wide Range Achievemnt Test was used. This part does not require reading and therefore does not introduce the variable of reading into the solution of computational problems.

For the purpose of extending the main study downward, a separate sample was introduced. This sample consisted of 125 cases, within the 70-79 I.Q. range and 12-17 years of age, selected at random from among the Camden Public Schools students. One hundred cases, within 12-16 years of age, were selected from an ungraded school for educable mentally retarded students.

The scores for each student included in the sample were expressed in terms of:

1. An I.Q.
2. Reading grade score.
3. Arithmetic grade score.
4. Actual grade placement.

For comparison of groups, ranges, means, standard deviations, *F* tests and *t* tests were computed. Also computed was Pearson's coefficient of correlation and the Spearman rank order coefficient for several relationships. A procedure which was found to be highly useful, was the division of the groups in terms of intelligence levels. The first group consisted of I.Q.'s 80-89, the second group from 90-99, and the third from 100-110.

## The Findings

A. Achievement in Reading. The analysis of variance tests for reading showed that differences between means due to I.Q. and age were significant at the .01 level of confidence. Furthermore, owing to the fact that the *F* test showed only that there was a significant difference within the set of data, *t* tests were computed to determine whether there was a significant difference in reading between the levels of I.Q. on the one hand and between the groups according to age on the other.

1. Significant differences were found not only between students of dull-normal and high-average capacity, but also, between students of low-average and high-average capacity.
2. Within every I.Q. group there was an increase in the average reading achievement up to 15 or 16 years of age.
3. After 15 years of age there were no significant differences in achievement between adjacent age levels.
4. Correlations between reading achievement and I.Q. were highly significant at all age levels. Table 2 shows correlation between reading and I.Q. at various age levels.

**Table 2**

Correlation between reading and I.Q. at the various age levels

| | C.A. | | | | | |
|---|---|---|---|---|---|---|
| | 12-13 | 13-14 | 14-15 | 15-16 | 16-17 | All ages |
| R | .71 | .66 | .83 | .60 | .57 | .65 |

B. Achievement in Arithmetic

1. No significant overall changes were found either due to I.Q. or age factors. There were differences in correlations between arithmetic and I.Q. as a function of age. For the sample as a whole the correlation between arithmetic and I.Q. was .30. Table 3 shows the correlations between arithmetic and I.Q. for the various age levels.

**Table 3**

Correlation between arithmetic and I.Q. at various age levels

| | 12-13 | 13-14 | 14-15 | 15-16 | 16-17 | All Ages |
|---|---|---|---|---|---|---|
| R | .59 | .39 | .54 | .02 | .09 | .30 |

The correlations were ranging from a negligible .02 at the 15-16 age level, to a moderate .59 at the 12-13 age level. The correlations between arithmetic and I.Q. in this sample were significant for the first three age groups.

2. There was no increase in average arithmetic achievement after 15 or 16 years of age.
3. Within the 90-110 I.Q. group, average educational achievement in arithmetic showed deceleration after 15 years of age.
4. Generally the differences in achievement between adjacent age levels were larger at the youngest age levels.

C. Relationship Between Reading and Arithmetic at Various I.Q. Levels

1. The correlation between reading and arithmetic for the whole sample was .61. This is a significant correlation beyond the .01 level.
2. Students of lower intellectual ability, regardless of age, tend to show better achievement in arithmetic than in reading.
3. Students of low average and average intellectual ability showed significantly better achievement in reading than in arithmetic after 15 or 16 years of age.

D. Actual Grade Placement and Achievement

1. The study showed a moderately high and positive correlation of .62 between achievement in reading and grade placement.
2. The study showed a low positive correlation of .31 between achievement in arithmetic and grade placement.
3. The study showed a consistent tendency for students of higher I.Q. levels to achieve at higher quartiles within their respective grades.
4. Within the low average or average ranges of I.Q.'s basic educational achievement was most commensurate with average grade placement from 13 to 15 years of age.
5. The overall results at average I.Q. levels showed that considerable differences between basic educational achievement and grade placement occurred at older age levels regardless of I.Q. levels. Spearman's rank difference coefficient of correlation revealed this to be a significant difference. Spearman's rank difference coefficient was used for this comparison due to the small number of cases involved. Table 4 shows the Spearman rank difference coefficients for the groups under study.

**Table 4**

Spearman's rank difference coefficients of correlation for achievement and grade placement for the age group 16-17

| Comparisons | M1 | M2 | D | Rho |
|---|---|---|---|---|
| Reading | | | | |
| 90-99 | 8.3 | 10.0 | 1.7 | .3894* |
| 100-110 | 9.4 | 10.2 | .8 | .5429 |
| Arithmetic | | | | |
| 90-99 | 7.5 | 10.0 | 2.5 | .2368** |
| 100-110 | 8.0 | 10.2 | 2.2 | .3072** |

** p value equal to or less .01
* p value at or below .05

E. Top Average Grade Levels

1. Although there were individual students within the 100-110 I.Q. range who were achieving at 10th or 11th grade levels, the average achievement for this I.Q. group did not exceed ninth grade level.
2. Students within 80-89 I.Q.'s commonly called "slow-learners", on the average did not achieve above seventh grade competency in basic educational skills. Table 5 shows average top grade levels for all C.A. group 12-17.

**Table 5**

Average top grade levels for all C.A. groups 12-17

| I.Q. | Reading | Arithmetic |
|---|---|---|
| 80-89 | 7.7 | 7.9 |
| 90-99 | 8.3 | 8.2 |
| 100-110 | 9.5 | 8.4 |

F. Possible Influence of Sex Variable

1. The present study failed to show any significant differences in average reading achievement between the sexes.

## Discussion and Summary

The findings of the present study have some practical significance and implications.

The importance of reading is generally recognized in our culture. It enables us to communicate with others, to acquire knowledge, and is in part responsible for the growth of our civilization. Learning how to read involves a capacity for abstract reasoning, ability to recognize symbols and to integrate them into a meaningful sequence. This implies a close relationship between intelligence and reading ability. As expected, the present study showed a moderately high relationship between I.Q. and reading which varied depending upon age level. In this connection, the correlations of the present study were in accord with the findings of other studies e.g. Gray (1955), Russell (1955).

Considering the narrow range of I.Q.'s (80-110) in the present study the differences between I.Q. groups were striking. These findings, at least for reading achievement, contradicted a common assumption that nearly all students of "average" ability can achieve at the same educational level.

Arithmetic is for us a part of everyday life and we generally assume that a close relationship exists between achievement in arithmetic and I.Q. However, the present study indicated only a moderate relationship between I.Q. and arithmetic for the age range 12-15 and a negligible relationship for the age range 15-17. One of the possible explanations for these findings, might be the emphasis placed upon reading and the neglect of arithmetic in our schools.

The present study revealed considerable variability in reading and arithmetic achievement within a given grade placement. This contradicts a traditional assumption that all students within ranges of dull-normal and average intelligence should progress one grade each calender year. However, there are several reasons why not all students placed in the same grade achieve at the same level. Lack of ability, absence of opportunity, ill health, changing schools frequently, and other factors in many instances militate against satisfactory achievement.

Although average grades obtained in the present study seem to be low, they correspond roughly to a theoretical situation where educational achievement in basic skills would be solely dependent upon mental potential excluding such factors as motivation, application, and opportunity. For this we would have to assume a perfect positive relationship between mental age and educational achievement. In this case a child of 100 I.Q. who reaches reading readiness at age 6-6, first grade competency at 7-6, second grade at 8-6 etc., would be expected to achieve 9th or 10th grade competency by 15 or 16 years of age. In the same way a child of 80 I.Q. whose rate of mental growth is slower and who would reach a mental age of 12 at 16 years of age would be expected to achieve no better than sixth or seventh grade competency.

While it was not a specific purpose of the present study to analyze the sex variable as a factor in educational achievement, a problem of possible differences due to sex was considered. The data indicated that there was no appreciable difference in the average achievement of boys and girls. The lack of real sex differences in educational achievement was also suggested by other studies; Traxler and Spaulding (1954), Davidson and Balducci (1956), and Russell (1955).

The findings of this study may be of some significance in their relation to (a) classroom procedures and their effect upon educational growth, and (b) the granting of high school diplomas as a result of an accumulation of credits.

With the advent of mass education the significance of the high school diploma has also been brought into question. The extreme ranges of intelligence quotients generally present among high school students would seem to suggest that a high school diploma is now within the reach of the vast majority. The inclusion in the high school program of an ever increasing range of mental capacity tends to affect the quality of this program.

Large classes in most schools and emphasis upon grade achievement are factors influencing teachers attitudes. Teachers tend to gear instructional material to the average level of the class. The brighter students are left on their own, with the result that they do as well as the others but not as well as they might. This implies the need for smaller classes and more individual instruction, which in turn is related to the problem of teacher supply.

Accordingly, it is suggested that studies be undertaken designed to investigate educational growth as related to motivation, socio-economic background and other factors. In addition other methods might be employed. This would involve the testing of the same students over a period of years, when they enter a junior high school and when they graduate from a senior high school. Moreover, the study of the relationship of educational growth to mental potential can also be done at the lower I.Q. levels e.g. 50-80, or the higher I.Q. levels e.g. 110-130.

It is also suggested that studies be undertaken designed to investigate the relationship between basic educational skills and achievement in other subjects. A series of such studies in different schools and in different parts of the country would provide for a better sampling of educational achievement and its improvement.

## References


Banker, H.J., "Mental Age Distribution in School Progress," *Journal of Educational Research,* Vol. 23, (1931), P. 273.

Bradway, K.P., "Predictive Value of Stanford Binet Preschool Items," *Journal of Educational Psychology,* Vol. 36, (1945), P. 1.

Collier, J. W., "The Predictive Value of Intelligence Tests for Secondary Education," *British Journal of Educational Psychology,* Vol. 3, (1933), P. 363.

Davidson, H., and Balducci, P., "Class and Sex Differences in Verbal Facility of Very Bright Children," *Journal of Educational Psychology,* Vol. 47, (1956), P. 476.

Gray, W. S., "Summary of Reading Investigations, July 1, 1954 to June 30, 1955," *Journal of Educational Research,* Vol. 49, (1955-56), P. 407.

Holmes, J. A., and Finley, C. J., "Under and Over Age Grade Placement and School Achievement," *Journal of Education Psychology,* Vol. 48, (1957), P. 447.

Keys, N., "The Value of Group Test I.Q.'s for Prediction of Progress Beyond High School," *Journal of Educational Psychology,* Vol. 31, (1940), P. 81.

Lennon, R. T., "The Relationship Between Intelligence and Achievement Test Results for a Group of Communities," *Journal of Educational Psychology,* Vol. 41, (1950), P. 301.

Russell, I. L., "Personality; Does It Influence Teachers Marks," *Journal of Educational Research,* Vol. 48, (1954-55), P. 563.

Traxler, A. E., and Spaulding, G., "Sex Differences in Achievement of Independent School Pupils as Measured by Stanford Achievement Test," *Educational Records Bulletin,* No. 63, (July 1954), P. 96.

Weber, E. G., "Equating High School Intelligence Quotients with College Aptitude Test Scores," *Journal of Educational Psychology,* Vol. 36, (1945), P. 443.

Votaw, D. F., "Regression Lines for Estimating Intelligence Quotient from American Council Examination Scores," *Journal of Educational Psychology,* Vol. 37, (1946), P. 179.

# A Program For Adjustment And Habilitation Of Retarded Young Adult Males

Bernard Niehm and Joseph Kradel

## The Setting

Through nearly three-quarters of a century over five thousand boys and girls have enjoyed the accepting, understanding, and encouraging atmosphere of The Training School at Vineland, N. J. Here, for greater or shorter periods of time — some for most of their lives — children have lived in the "Village of Happiness." (Byers, 1934). They have lived full lives, whatever their needs. For each there has been specific planning that every child might have a suitable program for training and living. Pearl Buck eloquently pointed up the potential of the mentally handicapped child when she wrote that "even the littlest candle will shine when lighted." (Buck, 1951).

## A Special Group and Problem

When this same writer so pointedly and touchingly told about "The Child Who Never Grew," (Buck, 1950) there was re-emphasized the needs of this very special group of children who need heartfelt, considerate help. For purposes of this discussion we will consider one segment of these special children. They are persons who have much to offer vocationally and economically because they come very close to being able to assume a normal role in society. They are the persons who differ only enough in recall, in insight, and in inhibition, to make life a hazard for them in ordinary competitive circles. They are persons who need special care and opportunities for a feeling of security and of being wanted. In some cases they are persons who already have become confused and upset and are likely to become more so if their needs are not met wisely and by people of professional training and experience. It is from this minimally so but nevertheless handicapped group of 'inefficients' (Pearson, 1914) that sooner or later society's social and economic derelicts come if denied proper training and supervision. These are 'borderline' persons or somewhat less, the mildly handicapped intellectually and in social adjustment.

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## A Program for Training-Living

The program described herein was designed to meet the needs of this special group in the relaxed atmosphere of cottage living and with a plan of training and care that is geared toward meeting their every development need. The Education Division provides a proper teaching-training program while special needs are met by the services of campus-available psychologists and psychiatrist, physicians and nurses, speech and hearing pathologist and therapists. Suitable working-living programs are available upon completion of the training period for each individual as diagnoses and classifications may indicate.

## Implementation of the Program

The trainee receives the full benefit of a well coordinated, multiple-disciplinary and functional approach to his problem through diagnosis and observation by clinical personnel. Their objective is continuous correct orientation of the individual for *effective living* during the training and post training period.

Candidates may be boys who are already pupils of The Training School or persons who by age and records meet requirements for admission to the program. These persons are generally at least eighteen years of age and preferably not over thirty years of age. They are persons classified as borderline or mildly handicapped. They are not unduly neurotic, psychotic, schizophrenic, or in any other way disturbed to the point of making training severely difficult or entirely unprofitable. They have expressed a sincere desire for training and work success which is supported by evidence from experience elsewhere or in trials at The Training School. Testing and counselling further validate the applicant's acceptability for the program. The intensive diagnosis is culminated in what is considered a tentative prognosis of potential. With a diagnosis that indicates the areas of strength and weakness, and a tentative prognosis of future potential made, a treatment program is outlined.

There follows application of teaching-training-supervisory principles and methods which continually recognize the importance of Thorndike's (1923) maturation, repetition, and satisfaction in work with the retarded. These conditions for learning are further embodied in a statement of philosophy principles, and techniques that characterize the program of teaching-training at The Training School. (Kradel, 1960).

## The Philosophy - Some Principles and Techniques for Teaching-Training

Although independent living is a worthy goal, *Effective Living* for the individual is considered a more acceptable goal. He should have maximum earning power; his personal behavior should be desirable at work and

in leisure periods. Teacher-trainers adapted to this special field are personable, patient, and persevering people acting in a suitable laboratory setting for demonstration, practice, correction, and repeated demonstration and practice. (Kradel, 1960). But in spite of maximum trainer-trainee effort, the value of the labor of the retarded may be very low. No amount of repetition or drill can make up for lacks in recall, insight, coordination or confused thinking. In training or work situations there must be tolerance for level and speed of performance, and personal-social attitudes and acts that are not appropriate.

Techniques, and definite and purposeful actions, to obtain significantly desirable conditioning of the trainee are paramount. These include use of the time clock or other careful recording of time of arrival and leaving, rewards and penalties for being steadily on the job or conversely, off the job. There are needed rewards and/or penalties for day by day regularity, at work job completion, and following instructions. Discussions, examples, demonstrations and bulletin board displays concerning the healthy, properly dressed person are helpful. The importance of getting along with everyone (interpersonal relations), and about accepting the kind of work available whether liked or not needs to be taught.

There is need to give the trainee this broad base of common work-a-day-world demands for personable, prompt, and dependable people. Manipulatory effectiveness might also be included in the broad base. Specific trade skills, as such, can fairly enough be relegated to the 'new' job.

Preparation, then, for the 'new' job is seen as a process of adjustment and habilitation of these young men. The inter-disciplinary approach is used to pick them up at that age and point of development when they are likely to profit more from vocational training than from academic training.

The trainee's entry into this program must follow a trial vocational period, a phase of the total Educational Program (See Appendix I) of The Training School. Entry may be as an apprentice if records and diagnosis so indicate. The training period is usually a two year period but may be modified at the discretion of the classification committee.

Following this inter-disciplinary guided period of adjustment and habilitation, classification committee placement puts the trainee in a working-living situation held to best fit his needs, and so for him there is continued growth toward "Effective Living." Such placement is certain to be within the framework of a scheme for Socio-Economic Classification proposed by Niehm (See Appendix II) and which recognizes potential for living and working from practically full independence to supervised living and sheltered working. (Kradel, 1960).

The roles played by the various disciplines in this unique program may be briefly described as follows: THE EDUCATION DIVISION provides courses for instruction and training, first, on a trial-vocational basis in small groups (4-8) and with special trainers. Regular production areas along with special shops are the laboratories. Trial vocational experience leads to apprentice placement. At this stage the trainee is associated on a one to one basis with skilled production workers. Occasionally it may be a one to two relationship . . . one production worker, two apprentices. For purposes of guiding trainers or production workers, courses of study outlining content and with suggestive procedures are available along with supervision. Evaluations or ratings of trainees become functions of their trainers or the worker with whom they are associated and the vocational supervisor. They use the "Report of Vocational Activity," (Kradel, 1960), a time card, but on which in addition to hours worked is noted the kind of work done and an evaluation with respect to quantity and quality. Quantity is indicated as a percentage of the average worker's possible production. Quality is indicated by 1 for excellent, 2 for good, 3 for fair, and 4 for poor. Thus a rating of 50/2 is given a person who produces approximately fifty percent of average worker expectancy and of a good quality. His 'factor' for purposes of comparison or pay is thus 25. This is an act of great importance for the trainee for his future is dependent in large measure on this evaluation. Training is available in numerous aspects of agriculture, in home and building construction and maintenance in its various phases, in food preparation and service, and in housekeeping, as well as in messenger and delivery service. The work level commonly attained is that of 'helper'. The Education Division basically provides counselling and inter-disciplinary guidance that leads to a well rounded and effective program for each enrollee.

COTTAGE MANAGEMENT provides a well rounded living program that includes situations and practices that promote "the healthy life" with foods prepared and served under professional dietary control; with a plan of regular hours of rest; with directed and free periods of play and recreation. "The happy life" results from opportunities at Canteen, at concerts, motion picture shows, recreation rooms, etc. Growing as a "helper in the family" results from becoming responsible in company with peers for personal needs and cottage care inside and out. "Becoming the lady or gentlemen" results from training in poise, good manners and in good grooming. Habits and attitudes of conforming acceptance and loyalty to a Supreme Being, "The Spiritual Life," grow out of regular prayers at meals and bed-time, Sunday programs, and stimulation directed towards attendance at the Church of choice.

In supporting roles highly trained personnel in Divisions of PSYCHOLOGY and PSYCHIATRY are constantly available for diagnosis, prognosis, and timely and continued therapy.

MEDICINE, working through a regularly staffed hospital, maintains a good health level that argues well for happiness and efficiency.

The SPEECH and HEARING DIVISION plays an important role by giving aid and support to communication skills which lead to a greater feeling of security and adequacy.

Thus, the Education Division uses the services of a highly integrated *inter-disciplinary* team to provide an effective vocational program for the adjustment and habilitation of young adult males for "*effective living*" within the residential setting for some and within the community for others.

## References


Byers, Joseph P., *The Village of Happiness,* The Training School, Vineland, N. J., 1934.

Buck, Pearl S., *The Child Who Never Grew,* The Training School, Vineland, N. J., 1950.

Buck, Pearl S., *Even The Littlest Candle,* The Training School, Vineland, N. J., 1951.

Kradel, J. C., *The Importance of Readiness, Exercise, and Effect in a Program of Adjustment and Habilitation for Retarded Young Adults,* Appendix I, A Program for Adjustment and Habilitation of Retarded Young Adult Males, The Training School, Vineland, N. J., 1960.

Kradel, J. C., *Teaching-Training Principles and Techniques of a Program for Adjustment and Habilitation of Retarded Young Adults,* Appendix II, A Program for Adjustment and Habilitation of Retarded Young Adult Males, The Training School, Vineland, N. J., 1960.

Kradel, J. C., *A Sheltered Workshop in an Institutional Setting,* Appendix III, A Program for Adjustment and Habilitation of Retarded Young Adult Males, The Training School, Vineland, N. J., 1960.

Kradel, J. C., *Report of Vocational Activity,* Appendix VII, A Program for Adjustment and Habilitation of Retarded Young Adult Males, The Training School, Vineland, N. J., 1960.

Pearson, Karl, *Mendelism and the Problem of Mental Defect,* London, England, Dunlan and Co., 1914.

Thorndike, E. L., *Psychology of Learning,* New York, N. Y.; Doubleday and Co., 1923.

# APPENDIX I

Chart of

The Programs of the Education Division, The Training School at Vineland, N. J.

## SCHOOL

*Nursery (C.A. 4-9)
*Pre-Primary (C.A. 6-11)
*Primary (C.A. 8-13)
*Intermediate (C.A. 10-15)
**Secondary (C.A. 14-20)
Extension Class for full day vocational trainees

*Boys and Girls "Trainable" and "Educable" grouped together.

**At secondary level boys and girls — "Trainable" and "Educable" separated. Some pupils also begin ½ day trial vocational.

## VOCATIONAL

TRAINING
Trial vocational period (C.A. 16-21)
(A two year program of trial vocational experiences)
Apprentice period (C.A. 19 and over)
(A two year program of opportunity to develop work skill and attitudes within a specific vocational area)

POST-TRAINING OR WORKING
Living at The Training School - working within the community about The Training School in competitive or non-competitive industry.
Living at The Training School - working at The Training School within the various sheltered workshop areas of The Training School.

Temporary or permanent return to community living and working for some individuals upon completion of Apprentice period or after a period in the post-training program.

## OCCUPATIONAL AND BEHAVIORAL THERAPIES

OCCUPATIONAL-SOCIAL-RECREATIONAL ACTIVITIES

*For school age children* mentally, emotionally, or socially unable to profit from the regular special class program.

*For young adults* not able to profit from regular vocational activities.

*For older residents* who are unable to participate in Post-training or working programs.

Temporary or permanent return to community for those individuals whose parents can provide a sheltered living environment.

Chart Revision 3/61, Niehm and Kradel

## APPENDIX II

A Scheme for Socio-Economic Prognostic Classification of Mentally Retarded Pupils — by B. F. Niehm, The Training School Memorandum, May 3, 1960 — Revised February 27, 1961.

This classification plan is purposed to indicate and briefly describe various levels of living and working expectancies. The individual is classified for C (community) or R (residential) placement by the classification committee. However, the final placement decision is in the hands of the parents, and so an alternative C or R is indicated in parenthesis. Thus the individual might be classified C-2 (R-1) or R-1 (C-2). The number symbol indicates level of "effective living" expectancy.

*Community Return*

C-1 Return to community for independent living.

C-2 Return to community for independent living with minimal help vocationally and socially.

C-3 Return to community to work in competitive surroundings but living under sheltered or supervised conditions.

C-4 Return to community to work in a sheltered setting but not necessarily a sheltered workshop, and needing home supervision.

C-5 Return to sheltered home life to work in a sheltered workshop.

C-6 Return to sheltered home life but unable to adjust to even a sheltered workshop.

*Residential Living*

R-1 Residential living with a minimum of supervision in living and vocational areas. (Vocational and social skills good.)

R-2 Residential living with fairly constant supervision needed in living and vocational areas. (Vocational and social skills fair.)

R-3 Residential living with constant supervision needed in living and vocational areas. Activities in work areas (semi-productive).

R-4 Residential living with constant supervision needed in living and vocational areas. Activities restricted to cottage area or highly sheltered shop area (in general non-productive).

R-5 Residential living with total supervision and much help in living areas. Occupational activities minimal and likely limited to a few simple cottage chores. (Non-productive)

# A Study of the Incidence, Types and Associated Etiologies of Hearing Loss In An Institutionalized Mentally Retarded Population

Seymour Rigrodsky, Frances Prunty, Leon Glovsky

The current interest in mental retardation has led to investigations in all phases of the field. Studies and surveys have been conducted by professionals interested in the diagnosis and training of the mentally retarded individual. After years of apparent neglect speech pathologists and audiologists have recently focused their attention on this vital area. This paper is an attempt to extend the information that is available in the fields of audiology and mental retardation.

## Survey of the Literature

In the literature of the past ten years, there have been a number of investigations that have been concerned with the measurement of auditory acuity in mentally retarded samples. Considering the unusual incidence of respiratory disorders and other pathological states that are found in the mentally retarded population, research has been conducted to determine the incidence and type of hearing loss manifested by such subjects. The following is a review of some of the available literature on hearing loss and mental retardation.

In one of the first major studies in this field, Birch and Matthews (1950) tested the hearing of 247 institutionalized children. The subjects in this study were between the ages of 10 and 39 and had mental ages of five years or more. Utilizing a screening technique they found, "There is a significantly larger proportion of hearing loss among institutionalized mental defectives in the age range from 10 to 19 years than in the non-defective population available for comparison." An interesting aspect of this report was the predictive factor that was determined for reliability of the hearing tests. In the M.A. range group between 4-1 and 5-0, the authors found that almost two out of every three subjects successfully passed an audiometric examination. They also found that a reliable audiometric test could be obtained for subjects in the M.A. range from 5-1 to 6-0. Of the

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sample studied, 32.7 per cent were severely impaired auditorily. The authors found that:

> *It is evident that the percentage differences . . . indicate 2 1/2 to 18 times as much hearing loss in the population of mental retardates, depending upon the frequency compared. These percentage differences are significant at the 1 per cent level.*

Reporting this high incidence of hearing loss, the investigators stated that when a diagnosis of mental retardation is being made, auditory acuity should be properly evaluated.

MacPherson (1952) in a questionnaire study found that most of the mentally retarded institutionalized children manifesting hearing losses were either deaf or severely hard of hearing. As an implication for therapy, MacPherson stated, "Between 19.2 per cent and 24.01 per cent of the deaf and/or hard of hearing mentally deficient in institutions for the mentally deficient have been reported as being of school age." Additional research and experience is needed in this vital area of training.

Johnston and Farrell (1954) measured the hearing acuity of 270 children at the Fernald State School. These tests covered the frequency range from 250 cycles per second through 6,000 cycles per second. They found that 24 per cent of this group showed significant impairment of hearing. A comparison of the hearing of children in the Massachusetts Public School System with the hearing of children at the Fernald School indicated that the incidence of hearing loss in the latter institution was five times that of the public school system. The authors also found a higher incidence of hearing loss in the male residents of the institution than in the male sample taken from the public schools. The hearing losses at the Fernald School was also of a more serious type than those found in the public school system. As a result of this survey, in which about 64 per cent of the children had a bilateral loss, a therapy program (1957) was designed for the group. The median intelligence quotient for this group was 54.5, as measured by the Stanford-Binet, Arthur Performance Scale, the Porteus Maze Test and the Goodenough Draw-a-Man Test. After therapy was completed, the authors found a significant improvement in the speech reception threshold of the subjects. Comparing the experimental group with the control group, they found that speech production had not improved, nor had any of the retarded group attained higher academic achievement.

In a study of 74 children enrolled at the St. Colletta's School for the Mentally Retarded, Schlanger (1953) found that approximately 30 per cent of the group suffered from auditory impairment, with 14 per cent of the children having severe hearing loss as defined by the American Medical Association.

Utilizing the techniques of Birch and Matthews, Foale and Patterson (1954) conducted a study of institutionalized male patients at the Lennox Castle Institution for Mental Defectives located in Scotland, and found that 33 per cent of the sample had deficient auditory acuity.

Testing 498 residents at the Vineland Training School, Schlanger and Gottsleben (1957) utilized audiometric techniques especially adapted for a mentally retarded population. The test included frequencies from 125 cycles per second to 12,000 cycles per second. The modifications made were a longer training period at 50 decibels for 250, 1,000, and 3,000 cycles per second, and an "ear-choice" technique. Bone conduction testing was also utilized. Of the 498 children tested, about 35 per cent had normal hearing, 14 per cent were impaired slightly at the extreme frequencies, 28 per cent were in the moderate loss category, and 6 per cent of the subjects were hard of hearing. Hard of hearing as defined in this study was, "Losses in both ears greater than 30 decibels but with residual hearing. Interferes with the hearing of speech." Deafness in one or both ears was found in one per cent of the sample. The criterion used for deafness was, "No response in affected ear (s) at any frequency at maximum output of the audiometer." There was greater hearing loss present in the population with a C.A. of 20 or more than in the lower C.A. group. A total of 17 per cent of the population was classified as "non-testable." Schanger and Gottsleben stated:

> *These children usually were below a mental age of five years, had personality disturbances of varying degrees, and social quotients below 40. Four-fifths of this group were of either organic or mongoloid etiology.*

In this study, the authors stated that the younger children who did not respond to standard audiometric testing may have responded to psycho-galvanic testing. They also indicated, "However, there was a high incidence of cerebral insult in this group of young retardates which might have affected PGSR audiometry results."

A group of researchers (1957) attempted to apply psycho-galvanic testing to 20 mental retardates ranging from 9 to 38 years of age. Sixteen of these subjects were chosen for the experiment because of possible hearing loss. Four of the children suspected of having hearing loss were classified as mongoloid. Psycho-galvanic testing was employed for the frequencies 100, 500, and 4,000 cycles per second. Upon completion of the testing, an attempt was made to obtain audiometric threshold by utilizing the traditional voluntary response techniques. The investigators found that they were able to achieve conditioning in a sample of subjects with low I.Q.'s. The authors stated, "We believe our most significant result is

the demonstration of essentially normal conditional GSR's in the major portion of a group of individuals of low I.Q."

There have been other studies which were designed to measure the responses of mentally retarded subjects to pure tone testing. Using the alternate ear technique, Bradley, Evans, and Worthington (1955) attempted to determine whether or not there was a relationship between I.Q. and time required to obtain threshold measurements. In this study, 60 children between the ages of 7 and 13 with an I.Q. range from 30 to 70, were administered hearing tests. The children were put into two groups, a middle group with an I.Q. range between 30 and 50, and a high grade group with an I.Q. range between 50 and 70. Using the alternate ear technique, the authors found that in the high grade group 43 per cent had hearing loss, while in the middle group 47 per cent showed impairment. When the standard hearing tests were given, 30 per cent of the high group demonstrated reduced acuity and in the middle group, 33 per cent of the subjects had hearing loss. In this study, "A loss greater than 20 decibels for 2 frequencies was considered as a significant loss." The authors concluded that the mental ages and intelligence quotients of the subjects were related to the time required to test the subjects, and that more rapid testing was accomplished with standard audiometric techniques than was achieved with the alternate ear technique.

One of the more recent investigations of hearing loss among the mentally retarded was reported by Kodman (1958). The 208 subjects used for this study were from the Kentucky Training Home, an institutional school for mentally retarded children and adults. The population was divided into two groups on the basis of age. One group ranged in age from 7 to 19 years with a mean age of 15.4 years. This group was called the young group. The old group ranged in age from 20 to 64 years with a mean age of 38.7 years. Of the 208 subjects, 189 were found to be testable by the procedures employed. For the young group the average M.A. was 6.8 years; the average M.A. of the old group was 6.4 years. M.A. was assessed by means of the Stanford-Binet and Wechsler-Bellevue I.Q. tests. Individual pure tone audiometry was used throughout. A screening method was used, 20 decibels at frequencies between 250 and 8,000 cycles per second. If a subject failed this screening test, a pure tone threshold examination was administered. A hearing loss was defined as a threshold of 30 decibels or greater at one or more frequencies in either ear. It was found that 19 per cent of the young group exhibited hearing loss, and 24 per cent of the old group exhibited hearing loss.

## Table 1

### Summary of Studies Reporting Hearing Loss in Mentally Retarded Individuals

| Investigator | Subjects | Technique Used | N | Incidence of Hearing Loss (Percentages) | |
|---|---|---|---|---|---|
| Birch and Matthews (1950) | Institutionalized Children and Adults | Pure Tone Screening | 247 | 32.7<br>50 | Severe<br>Some |
| MacPherson (1952) | Institutionalized Children | Questionnaire Sent to Institutions | | 50 | Severe |
| Schlanger (1953) | Institutionalized Children | | 74 | 30<br>14 | Some<br>Severe |
| Johnston and Farrell (1954) | Institutionalized Children | | 270 | 24 | greater than 20 db. |
| Foale and Patterson (1954) | Institutionalized Male Patients | Pure Tone Screening | 100 | 33<br>13 | Some<br>Severe |
| Bradley, Evans & Worthington (1955) | Institutionalized Children | | | | |
| | High Group | | | 43 | |
| | Middle Group | | | 47 | |
| | | Standard | | | |
| | High Group | | | 30 | |
| | Middle Group | | | 33 | |
| Schlanger and Gottsleben (1957) | Institutionalized Children and Adults | Various kinds of Audiometric Techniques | 498 | 14<br>28<br>6 | Slight<br>Moderate<br>Hard of Hearing |
| Kodman et al (1958) | Institutionalized Children and Adults | Pure Tone Screening | 208 | 19<br>24 | |

Table 1 contains a summary of the incidence of hearing loss as reported by various studies. The review of the literature has revealed that the percentage of hearing loss occurs with high frequency in a mentally retarded population. Percentages of hearing loss varying from 13 per cent to 55.5 per cent have been reported. However, it is important to point out that these results are only roughly comparable because the frequencies tested varied, and the criteria for a significant hearing loss were dissimilar. Very little of the available literature has attempted to establish the possible etiology of the hearing loss.

## Purpose

The major purposes of this survey were to establish the incidence of hearing loss and the occurrence of known pathologies considered contributory to hearing loss in the institutionalized mentally retarded population at The Training School at Vineland, New Jersey. In addition, the following information was reported in terms of incidence and occurrence: type of hearing loss, the age, sex, intellectual level and etiological classification of mental retardation of each of the individuals studied.

## Procedure

Each resident of the Vineland Training School is routinely given an audiometric evaluation upon admission, and yearly thereafter. The accumulated record and speech record of each individual in residence as of October, 1960 were analyzed for any data concerning auditory acuity. The available audiograms were then collected and analyzed. Of the present population, approximately 100 of the individuals had audiograms which were considered valid and were utilized in the survey. The authors attempted to make use of the latest audiograms possible. The remainder of the population was then tested by the authors. The subjects were given pure tone air conduction audiometric tests. For the severely retarded subjects and many of the children who range in age from four to eight chronologically, conditioning techniques were used and the test administered over several sessions to avoid distractions and fatigue. It was not possible to test the hearing of six per cent of the population. These individuals were usually highly distractible and hyperactive and even conditioning techniques were not feasible. Clinically these individuals are tested according to their reaction to noisemakers and speech stimuli.

Both the subjects tested and those whose audiograms were used were tested with an ADC model P60 A audiometer in a relatively quiet therapy room. The frequencies used were 1,000, 2,000, 4,000, 8,000, 1,000, 500, and 250 cycles per second in that order. The criteria used, for determining an impairment was a loss of 20 decibels or greater for any two frequencies in one ear.

The authors utilized the criterion established by Schlanger (1956) to determine the distribution of the various types of hearing loss. According to this system a conductive loss is 20 decibels or greater for frequencies 250, 500, 1,000 cycles per second. A perceptive loss was a depression of the frequencies 2,000, 4,000, 8,000 cycles per second. A mixed loss was a depression of both low and high frequencies. Each of the audiograms and records were then analyzed for the following variables: incidence, age, sex, intellectual level of functioning, and possible etiology of mental retardation and hearing loss.

## Subjects

From the total population at The Training School, those residents displaying a hearing loss were selected for the study. The individuals ranged from 5 to 71 years chronologically and each of the subjects was classified as mentally retarded.

This population is not representive of the entire range of mental retardation, as the subjects of this survey are of a higher socio-economic stratum of society than the usual institutionalized mentally retarded population. The Training School's population includes a minimal number of custodial cases.

## Results

The data revealed that of the 325 residents, 75, or 25 per cent of the population, had impaired hearing. This is approximately the same percentage that Schlanger and Gottsleben reported in 1956. However, reports have given percentages from 13 per cent to 55.5 per cent, Birch and Matthews (1950); Foale and Patterson (1954); and Johnston and Farrell (1954). Schlanger (1953, 1956) reported 30 per cent of 74 children and 32 per cent of 118 children had auditory impairments.

Analyzing the audiograms according to the established criterion, 11 per cent of the subjects were classified as having a conductive loss, 44 per cent with perceptive loss and 45 per cent of the population had a mixed loss. In the available literature, the authors found little information with which to compare the above findings. In many of the reported studies there were no attempts to classify hearing losses, rather the authors gave only the percentage of hearing losses greater than 25 and 45 decibels for selected frequencies.

There appeared to be in this population a higher percentage of males, than females with hearing difficulties. This survey showed that 69 per cent of the sample were males and 31 per cent were females. However, this is not a representative sample, as the enrollment at The Training School is 212 males to 113 females. Of the 69 per cent males, 6 per cent had conductive losses, 31 per cent perceptive losses and 32 per cent mixed losses. Five per cent of the females had conductive losses, 13 per cent perceptive losses, and 13 per cent with mixed losses. These statistics correlate with the study done by Johnston and Farrell (1954).

Schlanger and Gottsleben (1956) reported that there appeared to be a high percentage of hearing losses in the chronological age range of five to 20 years. The present study revealed that the highest percentage of children with hearing losses was in the age range from 11 to 30 years. This age group constituted 49 per cent of the total hearing loss population. A distribution, according to types of loss, of this group revealed that seven per cent displayed conductive losses, 16 per cent perceptive losses and 26 per cent mixed losses. Schlanger and Gottsleben (1956) reported that 27 per cent of the subjects, in the chronological age group of 50 and up, displayed a perceptive loss. In this study, only 16 per cent of the population, in this same age group, had perceptive deafness. Twelve per cent of this age range was classified as having mixed deafness. The lowest percentage of auditory impairments was found in the 5 to 10 year old group which constituted only four per cent of the losses in the population. This is a limiting factor as The Training School has only approximately 25 children of this age group in residence. The authors found that it is extremely difficult to obtain valid audiometrics of children in this chronological age group.

Each of the residents at The Training School is classified etiologically according to a classification code established by the American Association of Mental Deficiency (1959).

Thirty-six, the largest percentage of the residents in this study were medically classified as, "mental retardation associated with the diseases and conditions due to unknown and uncertain causes with structural reactions manifest," (1959). Twenty-six per cent was classified as, mentally retarded associated with diseases and conditions due to trauma or physical agent and 23 per cent due to diseases and conditions due to prenatal influences (1959). In this category, the entire population was mongoloid. There are 43 residents at The Training School who have been diagnosed as mongoloids and of this number, 26 or 60 per cent have hearing impairments. This limited sample revealed that there was a continuous drop for the high frequencies 2,000, 4,000, 8,000 cycles per second. The loss was generally found in the slight to moderately impaired range. Table 2 gives the summary of the incidence of hearing losses of mental retardates as classified medically and etiologically by the American Association of Mental Deficiency (1959).

There were many varied intelligence tests utilized with this mentally retarded population and the levels reported in this study have been assessed from results of these tests. However, most of the children had received either the Stanford-Binet or the WISC intelligence tests.

The American Association of Mental Deficiency in September, 1959 established new categories for describing the various levels of mental deficiency. Intelligence quotients 84-70 constitute borderline. Nine per cent of this sample were within this category. Thirty-one per cent of the hearing

## Table 2

### Summary of the Incidence of Hearing Loss Arranged According To The Etiological Classification Code of the American Association of Mental Deficiency

| | Mental retardation associated with diseases and conditions due to: | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Hearing Loss (Percentages) | infection | intoxication | trauma or physical agent | disorder of metabolism growth or nutrition | new growths | unknown prenatal influence | unknown cause with the structural reactions manifested | Mental retardation due to uncertain causes with the functional reaction alone manifest |
| Conductive | 0 | 1 | 8 | 0 | 0 | 0 | 1 | 0 |
| Perceptive | 7 | 1 | 9 | 0 | 0 | 11 | 15 | 1 |
| Mixed | 3 | 0 | 9 | 1 | 0 | 12 | 20 | 0 |
| Total | 10 | 2 | 26 | 1 | 0 | 23 | 36 | 1 |



## Table 4

### Possible Etiology of Hearing Loss of Present Population (Percentages)

| Prenatal | Natal | Childhood Neural Hypacuses | Adult Neural Hypacuses | Media Otitis | Unknown |
|---|---|---|---|---|---|
| Toxic Factors—2<br>Maternal Rubella—5<br>Trauma—7 | Anoxia—2<br>Rh Factor—4 | VIRAL INFECTIONS<br>Measles—21<br>Measles & Rubella—2<br>Measles & Chicken Pox—11<br>Measles, Chicken Pox & Mumps—6<br>Chicken Pox associated with high fever—8<br>High Fever only—4<br>Mumps—5<br>BACTERIAL DISEASES<br>Meningitis—4 | Presbycusis—5 | 8 | 6 |

loss population was classified in the mildly retarded range 69-55 I.Q. Twenty per cent was moderately retarded 54-40 I.Q. and 16 per cent was severely retarded 39-25 I.Q. Twenty-one per cent of the survey population have been diagnosed as being in the profoundly retarded range of 25 or below. The following represents an approximation of the distribution of intellectual functioning of the entire Training School population, borderline, .06 per cent, mild 24 per cent, moderate 27 per cent, severe 20 per cent, profound 11 per cent and normal .05 per cent. Table 3 summarizes the type of losses according to the intellectual level of functioning.

**Table 3**

Summary of the Type of Hearing Losses
According to Intellectual Level of Functioning

| Intellectual Level | I. Q. | Conductive Loss | Perceptive Loss | Mixed Loss |
|---|---|---|---|---|
| Borderline | (84-70) | 0% | 3% | 6% |
| Mild | (69-55) | 4% | 13% | 14% |
| Moderate | (54-40) | 5% | 1% | 14% |
| Severe | (39-25) | 0% | 8% | 8% |
| Profound | (25, below) | 1% | 19% | 1% |

The chronological classification of etiology as presented by Goodhill (1957) in Chapter Nine of *The Handbook of Speech Pathology* was used as a criterion for this study. Goodhill's classifications are:

A. Hereditary Neural Lesions
B. Acquired Neural Lesions
   1. Prenatal
      b. Infections
      a. Toxic factors
         Maternal rubella
         Congenital syphillis
   2. Natal
      a. Trauma
      b. Hypoxia and anoxia
      c. Rh factor
   3. Postnatal and Infantile Hypacuses and Anacuses
   4. Childhood Neural Hypacuses
      a. Viral infections
      b. Mumps
      c. Bacterial diseases
   5. Adult Neural Hypacuses
      a. Physical trauma
      b. Acoustic trauma
      c. Acquired syphillis
      d. Presbycusis
      e. Intracranial tumors
      f. Toxins - including streptomycin and other drugs

Based on the information supplied by The Training School medical staff and other consultants, it was possible to definitely associate hearing loss (usually children diagnosed as being deaf) with a specific medical factor. However, any discussion of the possible etiology of hearing loss must be prefaced by stating that many of Goodhill's etiological classifications for hearing loss might also be factors associated with the etiology of mental retardation. The possible closely related factors were: toxic factors, maternal rubella, trauma, anoxia, Rh factor, viral infections and bacterial diseases.

Of the population being studied, five per cent had medical records which would support maternal rubella as a cause of hearing impairment. Figure 1 gives a picture of a 16 year old resident whose possible etiology is maternal rubella. Two per cent of the reported cases revealed toxic factors. Figure 2 shows auditory impairment resulting from pre-natal intoxication. Seven per cent of the hearing loss population had medical histories which would support trauma (pre-natal or natal) as a cause of hearing loss; two per cent anoxia, and four per cent Rh factor.

Goodhill (1957) stated that viral diseases and infections accompanied by high fevers are causes of impaired auditory functions. In this study, the authors found that 21 per cent of the subject had had measles, two per cent measles and rubella, 11 per cent measles and chicken pox, six per cent measles, chicken pox and mumps, eight per cent chicken pox, all associated with high fevers for prolonged periods of time. In four per cent of the cases, the subjects had histories of high fevers with no accompanying viral diseases. It was found that five per cent of the subjects had mumps. Four per cent of the subjects had histories of meningitis. Figure 3 reveals the audiogram of a resident with a severe loss of hearing possibly associated with meningitis.

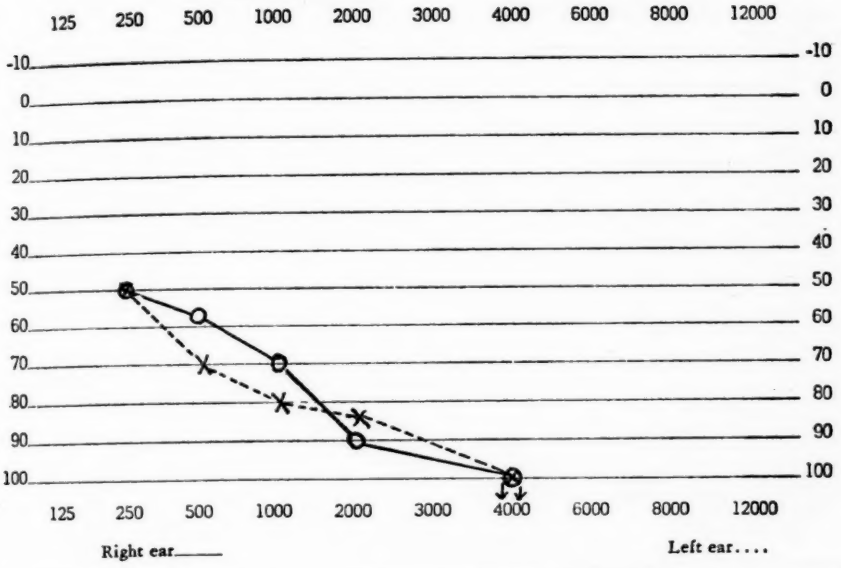
Goodhill (1957) lists presbycusis under adult neural hypacuses. In the age group over 50 years, this survey showed five per cent can be categorized as such. The medical records revealed chronic otitis media in six per cent of the population being studied. Two per cent of the subjects had had complete removal of the tympanic membrane. Six per cent of the population was placed in an unknown etiological classification. However, none of the subjects with hearing losses had histories which would support possible etiologies as physical trauma, acoustic trauma, acquired syphillis, intracranial tumors or toxins. Table 4 summarizes the possible etiologies of hearing loss as found in this population. (See pg. 38.)

## Discussion

This survey as well as the review of the literature has revealed that there is a high incidence of hearing loss found in mentally retarded subjects. The authors found a higher percentage of males than females with

FIGURE I

Audiogram denoting the hearing loss of a 16 year old resident whose possible etiology is maternal rubella. Results PGSR testing.




a hearing loss in this mentally retarded population. The results showed that approximately two males to every one female, in this sample, had impaired hearing. Forty-nine per cent of the total hearing loss population was found to be in the age group of 11 to 30 years. The cases with perceptive and mixed losses were almost equally distributed with a much smaller percentage having conductive losses.

According to the American Association of Mental Deficiency (1959) standards, 36 per cent of the population was etiologically classified as "mental retardation associated with diseases and conditions due to unknown or uncertain causes with the structural reactions manifest." Twenty-six per cent as "mental retardation associated with diseases and conditions due to trauma or physical agent." Twenty-three per cent was classified as "mental retardation associated with diseases and conditions due to prenatal influences;" this entire category was composed of mongoloids. The survey revealed that there is a tendency toward a high frequency hearing loss among the mongoloids. This survey revealed an almost equal distribution of all factors associated with the etiology of mental retardation.

As compared to the total population expectations there appeared to be a fairly equal distribution of hearing loss among the five intellectual levels evaluated. The greatest percentage of loss occurred in subjects

FIGURE 2

Audiogram denoting the hearing loss of a 21 year old resident whose possible etiology is pre-natal intoxication. Results PGSR testing.

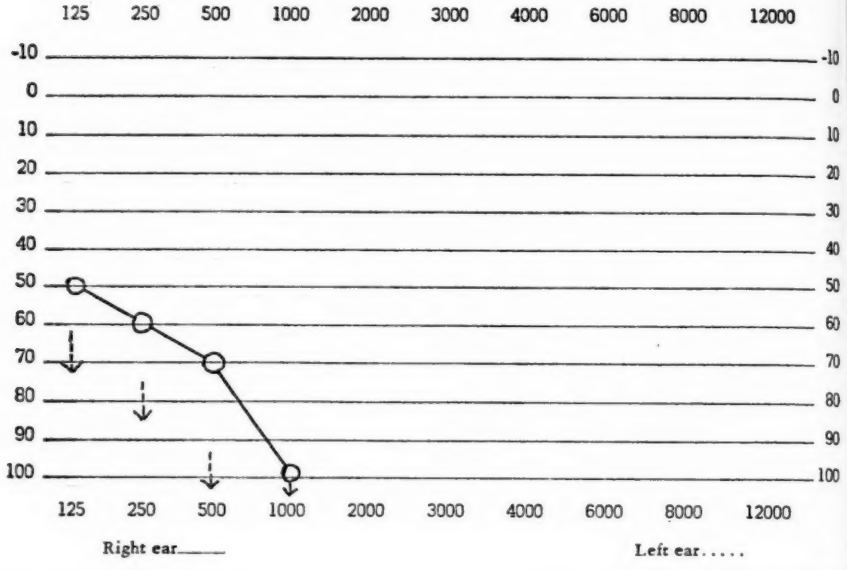
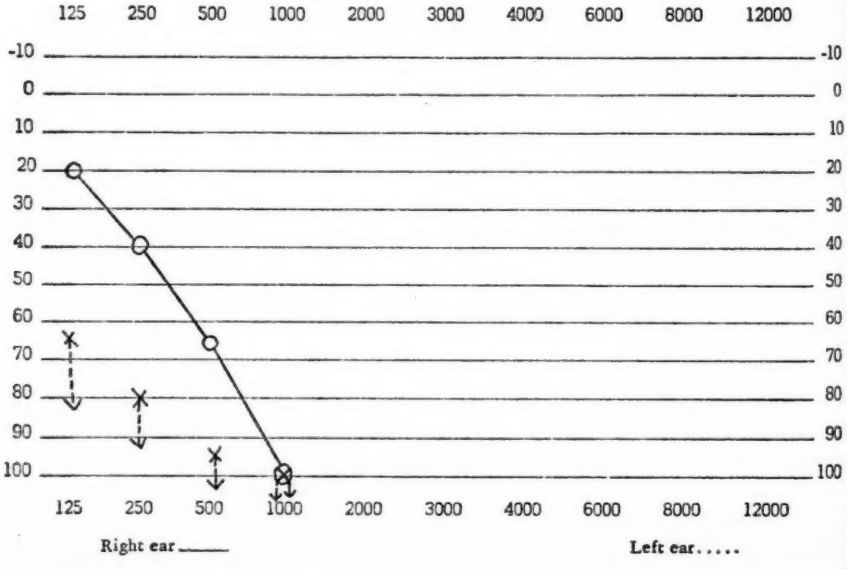



FIGURE 3

Audiogram denoting the hearing loss of a 17 year old resident whose possible etiology is meningitis. Results PGSR testing.



diagnosed as mildly retarded. According to the distribution of the entire population there appeared to be a higher occurrence of hearing loss in the profoundly retarded range than may have been expected.

For the possible etiology of hearing losses in this mentally retarded population, it was found that a high percentage of the subjects in this survey had some type of viral infection. Fifty-eight per cent of the population had measles, mumps or chicken pox.

Further research into the possible etiology of hearing loss found in mental retardates, plus a statistical study to correllate possible etiology of retardation and the possible etiology of hearing loss is needed. A study is necessary which would validate this study using different techniques such as PGSR, ear choice, and various other tests. Experimental classes for the educational and therapeutic procedures for the mentally retarded deaf are needed.[1]

## Summary

This paper has reported a survey of the incidence and possible etiology of the hearing loss of the institutionalized mentally retarded population at The Training School at Vineland, New Jersey. The subjects with hearing losses were reported as to sex, types of loss, chronological age, etiological class of mental retardation and possible etiology of hearing loss. The findings have been discussed and the implications of the results presented.

[1] *The authors are now involved in such a special classroom program for this type of population.*

## References


American Association of Mental Deficiency. *Statistical Manual,* Fourth Edition, Part I, Etiological Classification, Willimantic, Connecticut; American Association of Mental Deficiency, 1959.

Birch, J. N., and Matthews, J., "The Hearing of Mental Defectives; its Measurement and Characteristics," *Amer. J. Ment. Defic.* 55, P. 384-393. 1950.

Bradley, E, Evans, W. E. and Worthington, A. M., "The Relationship between Administration Time for Audiometric Testing and the Mental Ability of Mentally Deficient Children," *Amer. J. Ment. Defic.,* 60, P. 346-353. 1955.

Foale, Martha and Patterson, J. W., "The Hearing of Mental Defectives," *Amer. J. Ment. Defic.,* 59, P. 254-258. 1954.

Garrison, K. G. *The Psychology of Exceptional Children.* Revised Edition. New York: Ronald Press, P. 517, 1950.

Irwin, J. V., Hind, J. E. and Aronson, A. E., "Experience with Conditioned G. S. R. Audiometry in a Group of Mentally Deficient Individuals," *The Training School Bulletin,* 54, 2, P. 26-31, 1957.

Johnston, P. W. and Farrell, M. J., "Auditory Impairments Among Resident School Children at The Walter E. Fernald State School," *Amer. J. Ment. Defic.,* 58, P. 640-643, 1954.

Johnston, P. W. and Farrell, M. J., "An Experiment in Improved Medical and Educational Services for Hard of Hearing Children at the Walter E. Fernald State School," *Amer. J. Ment. Defic.,* 62, P. 230-237, 2, 1957.

Kodman, Frank Jr., Powers, Theodore R., Philip, P. Philip, Weller, George M., "An Investigation of Hearing Loss in Mentally Retarded Children and Adults," *Amer. J. Ment. Defic.,* 63, P. 460-463, 1958.

MacPherson, J. R., "The Status of the Deaf and/or Hard of Hearing Mentally Deficient in the United States," *Amer. Ann. Deaf.* 97, P. 373-386, 1952.

Schlanger, B., "Speech Examinaion of a Group of Institutionalized Mentally Handicapped Children," *J. Sp. and Hear. Dis.,* 18, P. 339-349, 1953.

Schlanger, B. and Gottsleben, R. H., "Testing the Hearing of the Mentally Retarded," *The Training School Bulletin,* 54, 2, P. 21-25, 1957.

Travis, Lee Edward, ed., *Handbook of Speech Pathology,* Chap. 9, Goodhill. New York: Appleton; Century-Crafts, Inc. P. 361, 1957.

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